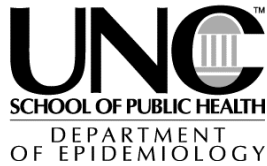


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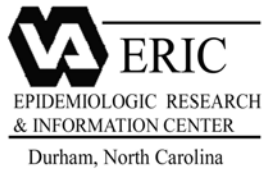


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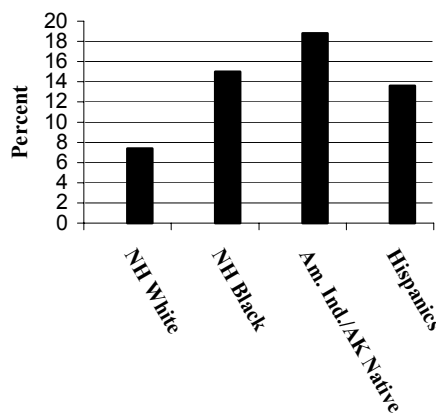
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Diabetes and Disparities

Diabetes mellitus is a significant public health concern in the United States. An estimated 17 million people have diabetes,¹ and more than 200,000 people die each year from complications related to diabetes.² Within the United States, some groups are disproportionately affected by diabetes, particularly racial/ethnic minorities, persons of low socioeconomic status (SES), and the elderly.^{1,3,4} The prevalence of diabetes among African Americans, Hispanics, and American Indians is more than twice that of Whites.¹ The prevalence of diabetes is especially high among American Indians. The Pima Indians of southern Arizona have the highest observed prevalence of diabetes – more than 50 percent in adults over 35 years of age.⁵

Age-adjusted prevalence of diabetes,
adults 20 years or older, by
race/ethnicity, US, 2000



Source: Data from Centers for Disease Control and Prevention¹ (NH = non Hispanic)

What is Diabetes?

Diabetes mellitus is a “complex disorder of carbohydrate, fat, and protein metabolism that is primarily a result of a deficiency or complete lack of insulin secretion by the beta (β) cells of the pancreas or resistance to insulin.”⁶ There are 3 major types of *diabetes mellitus*: type 1 (formerly known as insulin-dependent or juvenile-onset), type 2 (formerly known as

Non-insulin-dependent or adult-onset), and gestational diabetes.⁷

Type 1 diabetes accounts for an estimated 5 to 10 percent of all diabetes cases in the United States.³ This condition results from the destruction of β (insulin secreting) cells of the pancreas. The destruction of pancreatic β cells is believed to occur primarily through an autoimmune response, and a number of autoimmune antibodies may be detected during the preclinical phase of the disease. The onset of this disease primarily occurs during childhood or adolescence.⁷

Type 2 diabetes accounts for an estimated 90 to 95 percent of all diabetes cases in the United States.⁸ This form of diabetes is characterized by insulin resistance and/or deficiencies in insulin secretion. Insulin resistance occurs in muscle, liver, and adipose (fat) tissue.⁷ This disease is diagnosed mostly in persons 40 years or older; however, recently there has been an increase in the prevalence of type 2 diabetes among younger adults and children.⁹

Gestational diabetes occurs among nearly 4 percent of all pregnant women in the United States.⁸ This form of diabetes is the result of insulin resistance and insulin deficiencies associated with pregnancy in women who do not have a prior history of diabetes.⁷ Gestational diabetes may result from an unrecognized preexisting condition or hormonal changes or stress during pregnancy.¹⁰

Other types of diabetes comprise 1 to 2 percent of diabetes cases. These other types of diabetes result from genetic deficiencies in pancreatic β cell function and insulin production, other diseases of the endocrine glands or pancreas, use of certain drugs or chemicals, infections, and genetic syndromes.⁷

Diabetes Symptoms

Symptoms of diabetes may include extreme hunger and thirst, increased tiredness, blurred vision, frequent urination, unexplained weight loss, irritability,⁸ extremely dry skin, slow healing sores, and feelings of numbness or tingling in hands or feet.¹¹ The onset of type 1

diabetes may include these symptoms as well as nausea, vomiting, or stomach pains.¹¹ Not all persons with diabetes present with symptoms.¹² For some persons with type 2 diabetes, there is an asymptomatic period of about 10 years, during which high blood glucose levels are present and complications are developing.⁹

Diabetes Complications

Complications associated with diabetes contribute significantly to the burden of the disease.¹³ Complications include cardiovascular disease, stroke, retinopathy, end-stage renal diseases, neuropathies, foot ulcers and amputations, diabetic ketoacidosis and, for pregnant women, birth defects and fetal death.¹³ Disparities between racial/ethnic groups exist for many of these complications. For example, African Americans with diabetes are more likely to undergo lower extremity amputations compared with Hispanic or white persons with diabetes, and retinopathy is nearly 50 percent higher in African Americans with diabetes compared to whites with diabetes.¹⁴ From 1987 to 1990, the incidence of end-stage renal disease among American Indians with diabetes was nearly 6 times that of whites.¹¹

Medical Management of Diabetes

Appropriate management of diabetes requires regular physician visits, outpatient monitoring, nutrition and exercise therapy, and insulin and drug therapy to maintain physical functions and avoid complications.¹⁵⁻¹⁷ Glycemic control – regulation of blood glucose levels – is the key element in the management of diabetes.¹⁶ Regular interactions between the physician and patient are important for identifying complications, assessing glycemic control, and discussing aspects of the treatment process.¹⁷ Blood glucose levels may influence decisions about adjustments in medication, diet, or exercise regimen,¹⁶ and self-monitoring provides warnings of possible hypoglycemia or ketoacidosis.¹⁵ Glycemic control may also be monitored by patients.¹⁶

The goals of nutritional therapy include the maintenance of normal blood glucose levels, maintaining appropriate blood pressure, attainment of optimal serum lipid levels, provision of adequate caloric intake for desirable weight and growth, prevention and treatment of complications associated with diabetes, and the overall improvement of individual health.¹⁸ Benefits of exercise therapy include weight loss, improved glycemic control, lowered blood pressure, improved insulin sensitivity, improved lipid profile, and reduced cardiovascular mortality.¹⁹ Although there are some risks associated with increased physical activity (e.g. hypoglycemia, detrimental effects on long-term complications of diabetes, and increased risk of angina pectoris, myocardial infarction, and cardiac arrhythmias),

appropriate exercise is central to good diabetes management.²⁰

For persons with type 1 diabetes, an appropriate diet must coincide with required insulin therapy.¹⁵ Daily caloric requirements must be distributed such that hypoglycemia and extreme deviations in blood sugar do not occur.¹⁶ Generally increased physical activity is not sufficient to achieve long-term glycemic control because there may be increased food intake to compensate for energy expended during exercise regimens and average blood glucose levels may remain unchanged.²⁰

For persons with type 2 diabetes, total energy intake is an important part of nutritional management of the disease. Most persons with type 2 diabetes are obese, and reductions in total energy intake and increased physical activity are recommended to reduce body fat, decrease insulin resistance, and improve glycemic and lipid control.¹⁸

Persons with type 1 diabetes require insulin therapy for the prevention of hyperglycemia.¹⁶ Insulin therapy may also be required for persons with type 2 diabetes if glycemic control is not achieved by diet, exercise, or oral medications.⁷ Insulin therapy provides diabetics with a full replacement of daily insulin requirements. Subcutaneous insulin injections or insulin introduced by a pump mechanism are delivered in patterns that are similar to the normal production of insulin in the body.¹⁶

Drug therapies are important in preventing complications associated with diabetes and improving blood glucose control for persons with type 2 diabetes. Sulfonylurea, metformin, and troglitazone are some of the oral hypoglycemic agents used in treating type 2 diabetes. Combination therapies may also be used to improve glycemic control. The specific drug therapy will depend upon preexisting conditions, side effects, cost, age, physical disabilities, and patient compliance.²¹

In addition to glycemic control, managing blood pressure and cholesterol also represent critical goals of diabetes management. The United Kingdom Prospective Diabetes Study found that those type 2 diabetic patients assigned to tight blood pressure control had a reduction in risk of having a diabetes related death of 32%, stroke of 44% and microvascular complication of 37% when compared with patients assigned to less tight control.²² Because of the potential to reduce risk of complications and the fact that atherosclerosis accounts for 80% of all diabetes deaths, appropriate therapies for addressing hypertension and dyslipidemia are central to proper medical management of diabetes.²³

More information on the care of diabetes can be found in the VA/DOD Diabetes Clinical Practice Guideline. It is available on the World Wide Web at http://www.oqp.med.va.gov/cpg/DM/DM_base.htm.

Diabetes among America's Veterans

Diabetes is a major health concern for America's veterans. Nearly 16 percent of all Veterans Affairs (VA) patients have been diagnosed with diabetes.^{24, 25} Nearly 70 percent of patients discharged in 1998 from the Veterans Health Affairs' medical centers with an amputation-related discharge were veterans with diabetes.²⁶

In order to improve the quality of care for diabetes patients, the Department of Veteran Affairs, along with other federal agencies, have developed national guidelines for the prevention and treatment of diabetes.²⁶ These guidelines call for the screening of persons with known diabetes risk factors (see below). The VA has also established a national diabetes registry among VA patients.²⁴ In 1998, the VA launched the Quality Enhancement Research Initiative for Diabetes Mellitus (QUERI-DM).²⁷ The objectives of QUERI-DM are to (1) describe the current level of diabetes care, (2) develop a system for monitoring quality standards, (3)(a) assess the effectiveness of approaches for diabetes care, and (b) assess the effectiveness of the implementation and distribution of guidelines, and (4) initiate quality-improvement projects.²⁶

Risk factors for Type 1 Diabetes

Genetic and environmental risk factors may play an important role in the development of type 1 diabetes.^{12, 28} Family history of diabetes increases risk of the disease, and genes associated with the HLA-DR and DQ regions are associated with type 1 diabetes.¹² Also, genetically susceptible persons who have antibodies to glutamic acid decarboxylase or to islet cell antigens are at risk for developing type 1 diabetes.²⁸

Environmental factors associated with type 1 diabetes may include seasonality, viruses, and childhood diet.^{12, 28} Type 1 diabetes incidence usually declines during the warm months in both the Northern and Southern hemispheres.¹² It is thought that some viral infections (herpesviruses, mumps, rubella, and retroviruses)¹² may cause viral or host antigens to be expressed on the β cells of the pancreas, resulting in the production of islet cell antibodies.²⁸ Breastfeeding has been associated with decreased risk of type 1 diabetes.²⁸

Risk factors for Type 2 Diabetes

Major risk factors for type 2 diabetes include pre-diabetes, genetics, gestational diabetes, obesity, and physical inactivity.^{12, 29} Pre-diabetes is a condition characterized by impaired glucose tolerance (a fasting plasma glucose of 110-125mg/dL) and impaired fasting glucose (a 2-hour plasma glucose of 140-199 mg/dL).¹⁷

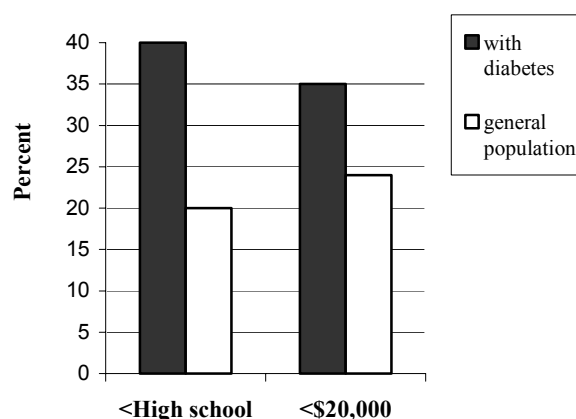
Persons with a family history of diabetes are more likely to develop the disease.^{12, 29} One hypothesis is the existence of a "thrifty gene" that enables people who had this gene to store food efficiently and survive longer periods without eating. With the current abundance of food, persons with this gene are more likely to become overweight and thus more likely to develop diabetes.¹²

Obesity and physical inactivity are two modifiable, interrelated risk factors for diabetes that are increasing in the United States.³⁰ Overweight is defined as a body mass index between 25.0 to 29.9 kg/m², and obesity is defined as a body mass index of ≥ 30 kg/m².³¹ In 1999, an estimated 35 percent of adults aged 20 to 74 years were overweight, and another 27 percent were obese.³¹ About 27 percent of US adults reported physical inactivity.³⁰ The degree of obesity and the location of excess weight both influence diabetes risk.¹² Also, physical inactivity has adverse effects on insulin sensitivity and blood glucose levels.⁴

SES Disparities in Diabetes

Prevalence and mortality of diabetes in the United States vary widely by socioeconomic status.^{4, 32, 33} The age-adjusted diabetes death rate for persons with a family income of less than \$10,000 is nearly 3 times as high as that for persons with a family income of more than \$25,000.³² Adults with diabetes are twice as likely to have less than a high school education compared with persons in the general population, and 35 percent of persons with diabetes have an annual income of less than \$20,000 compared with 24 percent of persons in the general population.³⁴

Educational attainment and income, persons with diabetes and the general population, US, 1994



Source: Data from National Academy on an Aging Society³⁴

Access to Resources and Services

Low SES exacerbates problems from diabetes and its complications.^{3,4,35} In 2002, the average health care expenditure for persons with diabetes was \$13,243, compared with \$2,560 for persons without diabetes.³⁶ Diabetics, especially those with low education and income who lack adequate insurance coverage, may not be able to afford appropriate care, with consequent delay in or omission of necessary preventive and treatment services.^{35,37,38} For example, Burge *et al.*³⁵ found that newly diagnosed diabetes patients reported a lack of health insurance as a primary reason for not seeking medical care. In an analysis of access problems among diabetes patients in the VA and a county health care system, Piette³⁷ found that county patients were less likely to obtain medications and urgent care because of concerns about cost.

Low SES may make the management of diabetes through exercise and nutritional therapy more difficult. Within some low SES communities, diabetics or persons at risk for diabetes may not have access to recreational facilities. For example, among residents in a small US city, low SES neighborhoods had significantly fewer resources for physical activity, compared with medium and high SES neighborhoods.³⁹ Similarly, among US adults, Parks, Housemann, and Brownson⁴⁰ found that residents with low income were less likely to meet the public health recommendations for physical activity, compared with high-income residents.

Futhermore, choosing an appropriate diet is influenced by the availability and cost of foods within the community.⁴¹ Persons in low SES neighborhoods may not have access to adequate grocery stores and may not be able to afford healthier foods. Low-income, urban African American patients with non-insulin-dependent diabetes identified the cost of low-fat and sugar-free foods as a barrier to dietary therapy.⁴² Among several areas in North Carolina, Minnesota, Mississippi, and Maryland, Morland *et al.*⁴¹ found that wealthier neighborhoods had more than 3 times the number of supermarkets found in low wealth neighborhoods.

Health Literacy and Diabetes Disparities

Adequate health literacy is the ability to perform basic reading and mathematical skills related to one's health care (see Notebook 29).⁴⁴ For diabetics, adequate health literacy requires the ability to read instructions for medication, interpret blood glucose readings or dosing schedules, and comprehend diabetes educational materials.⁴⁵ Diabetics and pre-diabetics need to be able to understand their disease and related health behavior changes that need to be made.⁴⁶ Inadequate health literacy acts as a barrier to quality health care.⁴⁵ For example, Williams *et al.*⁴⁶ found that diabetics who had

inadequate health literacy were less knowledgeable about their disease, compared with diabetics with adequate health literacy. Similarly, Schillinger *et al.*⁴⁵ found that diabetics with inadequate health literacy were more likely to report complications associated with diabetes and poorer control of their blood glucose levels.

Culture and Disparities in Diabetes

Differences in cultural beliefs and traditions also contribute to disparities in the utilization of health care services for diabetes management.^{5,47,48} For example, the development of fatalistic beliefs can have a negative impact on treatment and prevention efforts (fatalism is defined as a "belief that events are fixed in advance so that human beings are powerless to change them.")⁴⁹ Some Hispanics may feel that the disease is a judgment that can be cured only by their faith. In such situations, treatment may not be sought until complications and poor health are apparent.⁴⁸

Community myths and traditions can be additional barriers to the utilization of health care services. Traditional Hispanic beliefs attribute the onset of diabetes to *susto*, a "fright or highly stressful event."⁵ Various myths about diabetes and its treatment may be passed down through families.^{5,48} For example, diabetics who require insulin therapy may not take treatments or appropriate dosages because of beliefs that insulin can cause blindness, amputations, or even death.⁵

The use of alternative or folk medicines can present a major barrier to the utilization of appropriate drug therapies for diabetes management.^{5,47,48} For example, cactus leaves, garlic, and aloe are common treatments for controlling diabetes among some Hispanic groups.⁴⁸ Diabetics may choose such alternative methods for treatment and control of their diabetes instead of conventional therapies recommended by their physician.⁵ The awareness of alternative methods in addition to conventional, Western medicine is important for addressing the management of diabetes, especially among some racial/ethnic minority groups.

Additional cultural differences in diet and physical activity may influence disparities in diabetes.⁴⁷ For example, some minority women regard being overweight as healthy.⁴⁷ Weight loss may also be viewed as a sign of disease. Such perceptions and beliefs may present barriers to engaging in physical activity.⁵⁰

Conclusion

This Notebook has described factors that contribute to diabetes disparities. Diabetes remains a "hidden disease"¹ with an estimated 6 million people believed to have undiagnosed diabetes.² Racial/ethnic minorities and persons of low SES are particularly affected by diabetes and its complications.

Helpful Web Sites:

American Association of Diabetes Educators

<http://www.aadenet.org>

American Diabetes Association

<http://www.diabetes.org>

CDC Division of Diabetes Translation

<http://www.cdc.gov/diabetes/>

Diabetes Action Research and Education Foundation

<http://www.diabetesaction.org>

Juvenile Diabetes Research Foundation International

<http://www.jdrf.org>

National Diabetes Information Clearinghouse

<http://diabetes.niddk.nih.gov>

National Institute of Diabetes and Digestive and Kidney Disease

<http://www.niddk.nih.gov>

VA Diabetes Program

<http://www1.va.gov/diabetes>

VA Diabetes Quality Enhancement Research Initiative

http://www.va.gov/annarbor-hsrd/queri/queri_index.htm

VA/DOD Diabetes Clinical Practice Guideline

http://www.oqp.med.va.gov/cpg/DM/DM_base.htm

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Affiliation: VA _____ Other Gov't _____
Academic _____ Private _____

Please fax to: 919-416-5839 – Attn: Beth Armstrong

Or Email: beth.armstrong@duke.edu

Mail to: Beth Armstrong, ERIC Program Manager, VA Medical Center (152), 508 Fulton Street, Durham, NC 27705

Upcoming Topics

- Healthcare Epidemiology:
Chronic Illness Management

Please let Beth Armstrong know which topics are of special interest to you so that we can include them in future issues:

beth.armstrong@duke.edu

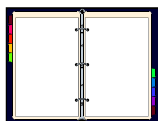
Reminder:

Online **education certificates** are available for each ERIC Notebook (1 hour of AMA Category 2 CME credit). ERIC notebooks and education certificate questions can be viewed online at:

<http://www.sph.unc.edu/courses/eric>

ERIC notebooks can also be viewed online at:

<http://hsrd.durham.med.va.gov/ERIC/Education/Education.html>



ERIC Notebook

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